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(54) **ELECTRONIC SWITCH FOR DROP-FREE CANDLE**

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(51) **Int. Cl.**<sup>7</sup> ..... **F23D 3/16**

(52) **U.S. Cl.** ..... **431/253; 431/289**

(58) **Field of Search** ..... 431/253, 289, 431/291, 288, 292, 126; 362/161, 810, 554

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

- 3,744,957 A \* 7/1973 Wright, Sr. .... 431/126
- 4,477,249 A \* 10/1984 Ruzek et al. .... 431/253
- 4,568,269 A \* 2/1986 Lin ..... 431/253

- 4,983,119 A \* 1/1991 Lin ..... 431/253
- 5,015,175 A \* 5/1991 Lee ..... 431/253
- 5,807,096 A \* 9/1998 Shin et al. .... 431/253
- 6,050,812 A \* 4/2000 Chuang ..... 431/253
- 6,074,199 A \* 6/2000 Song ..... 431/253

**FOREIGN PATENT DOCUMENTS**

FR 2 637 721 A \* 4/1990

\* cited by examiner

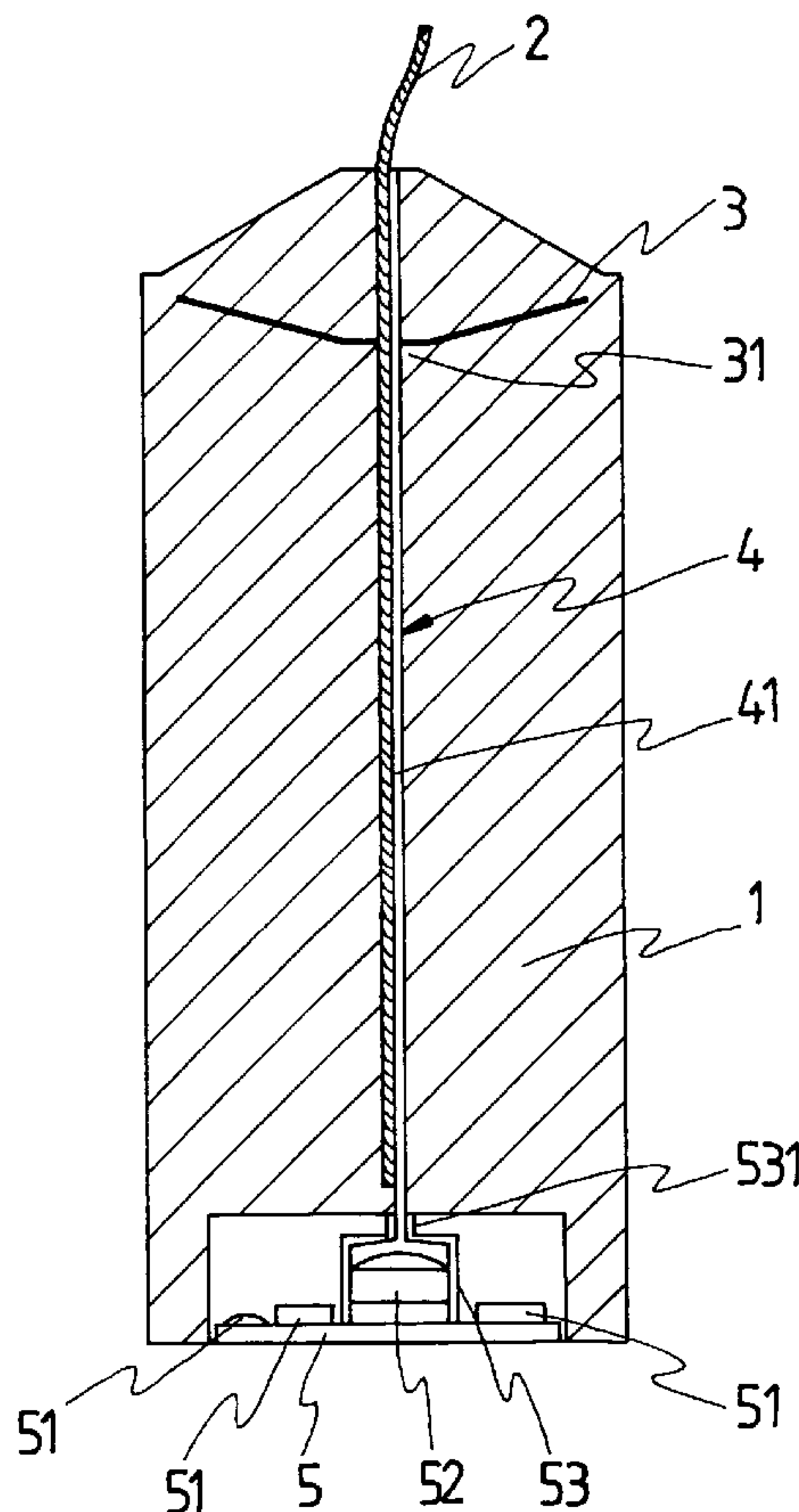
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(57) **ABSTRACT**

An electronic switch for a drop-free candle is comprised of a candle, a wick, a metal disk, a conductor and a circuit board; the metal disk being buried in the candle; the conductor being provided in the form of an optical fiber or a magnet twisted pair cable; the conductor being provided along the wick to control the operation of the circuit board provided at the bottom of the candle to realize the function of an electronic switch while preventing drops of the fattening substance of the candle.

**2 Claims, 5 Drawing Sheets**



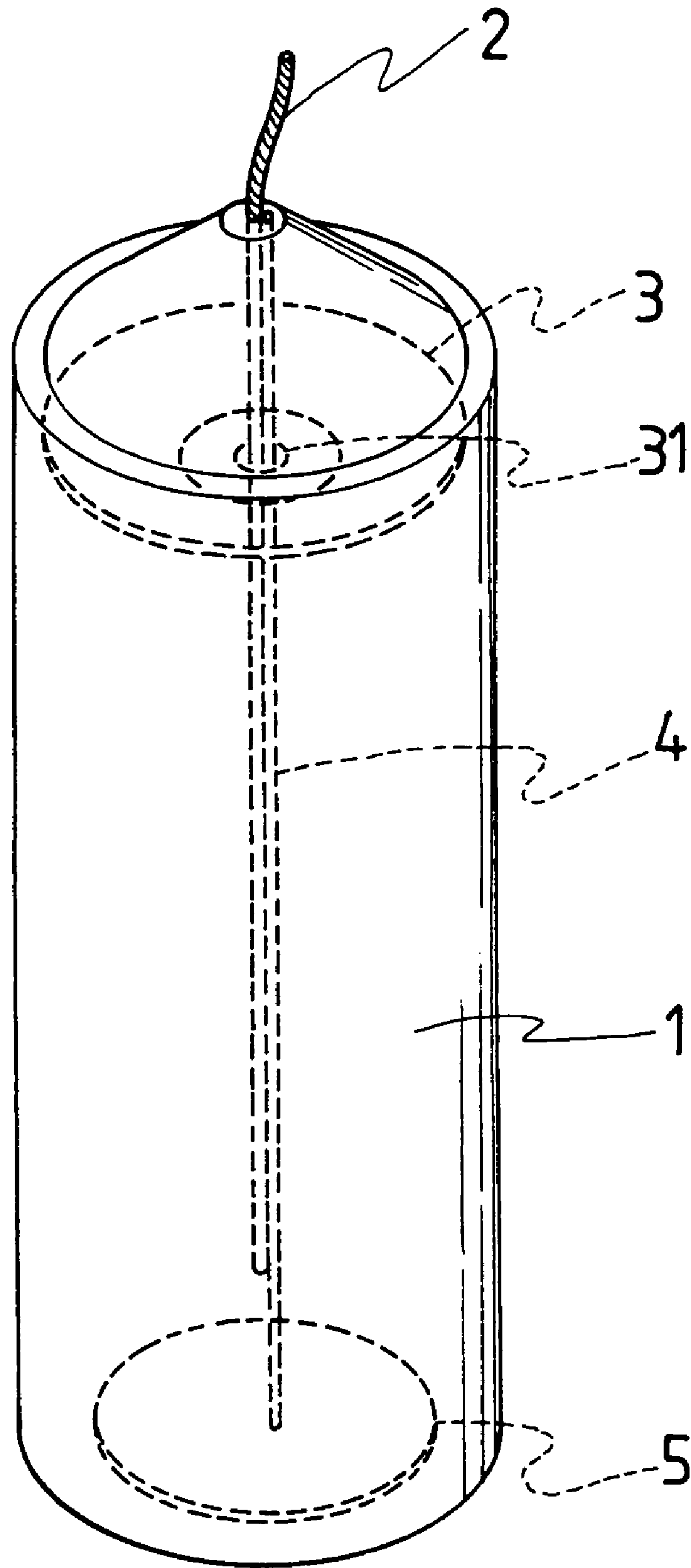


FIG.1

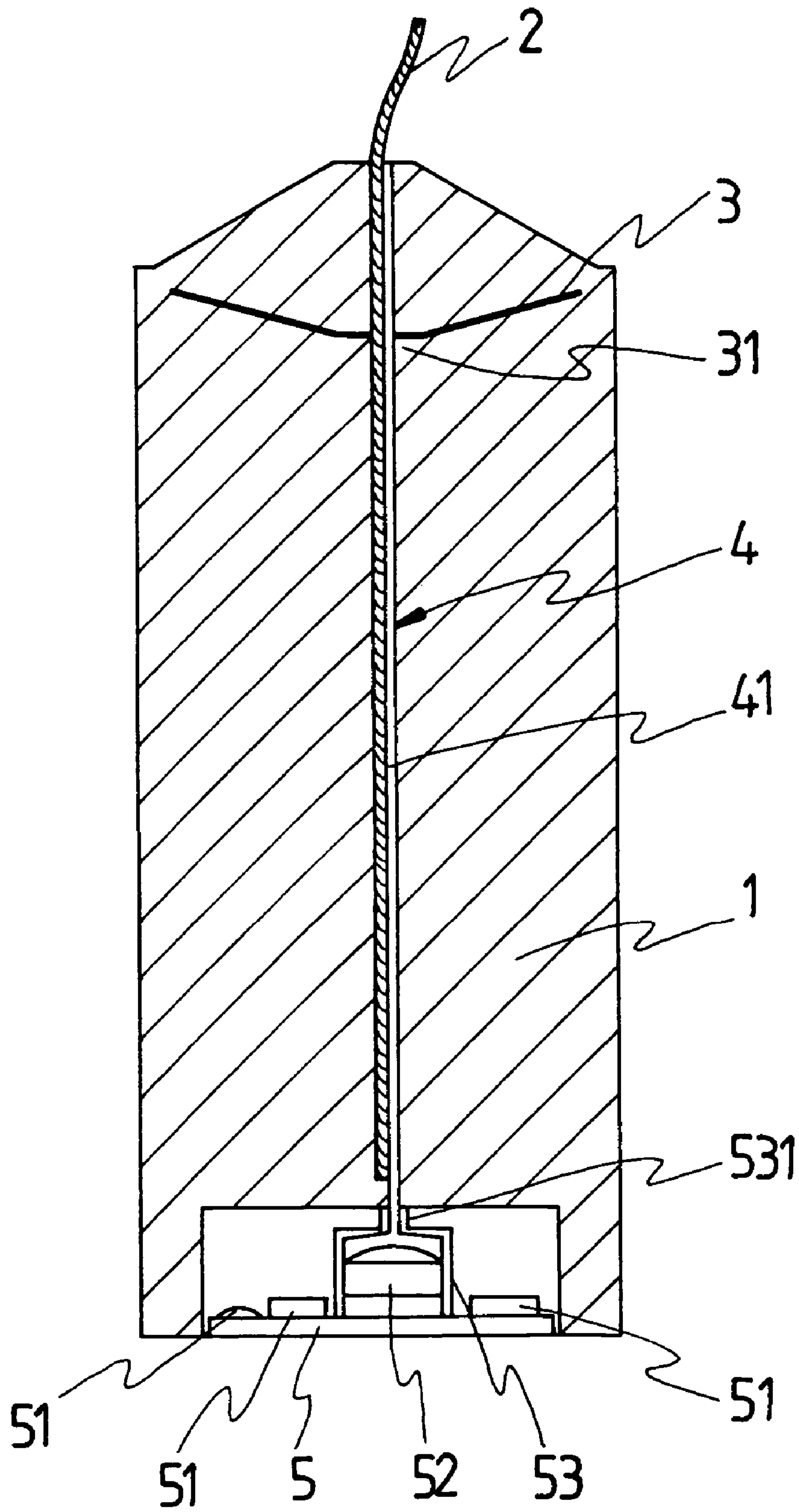


FIG.2

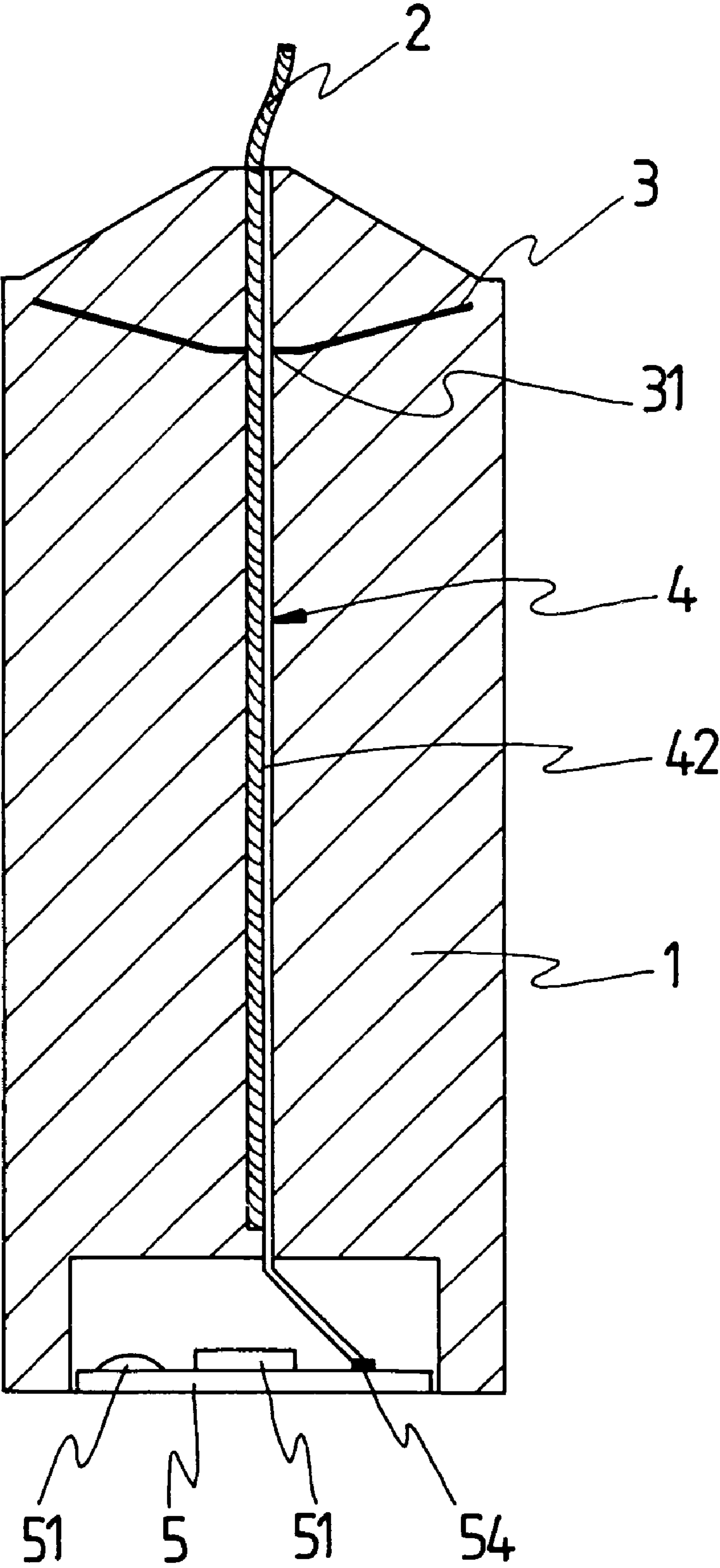
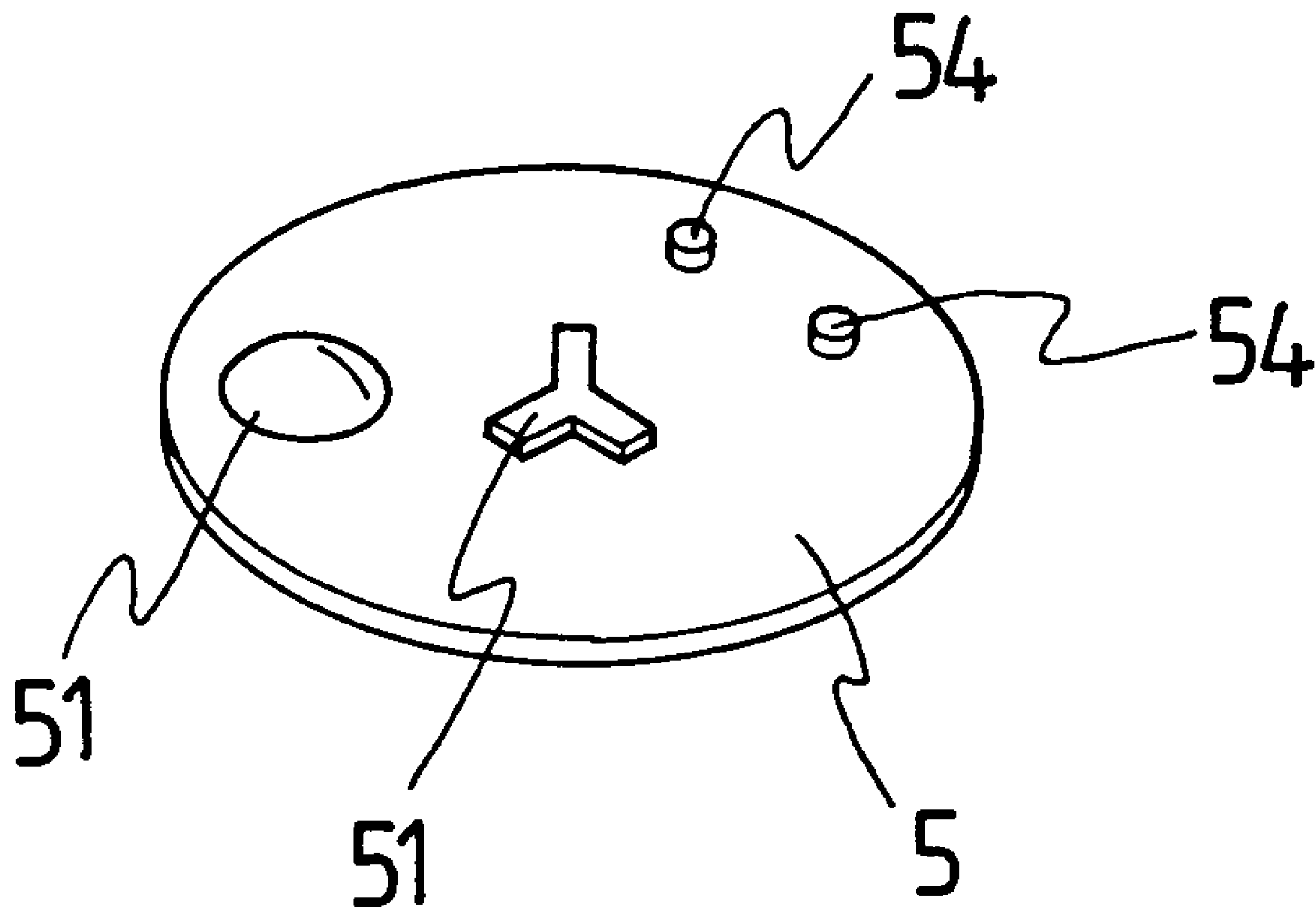


FIG.3



**FIG. 4**



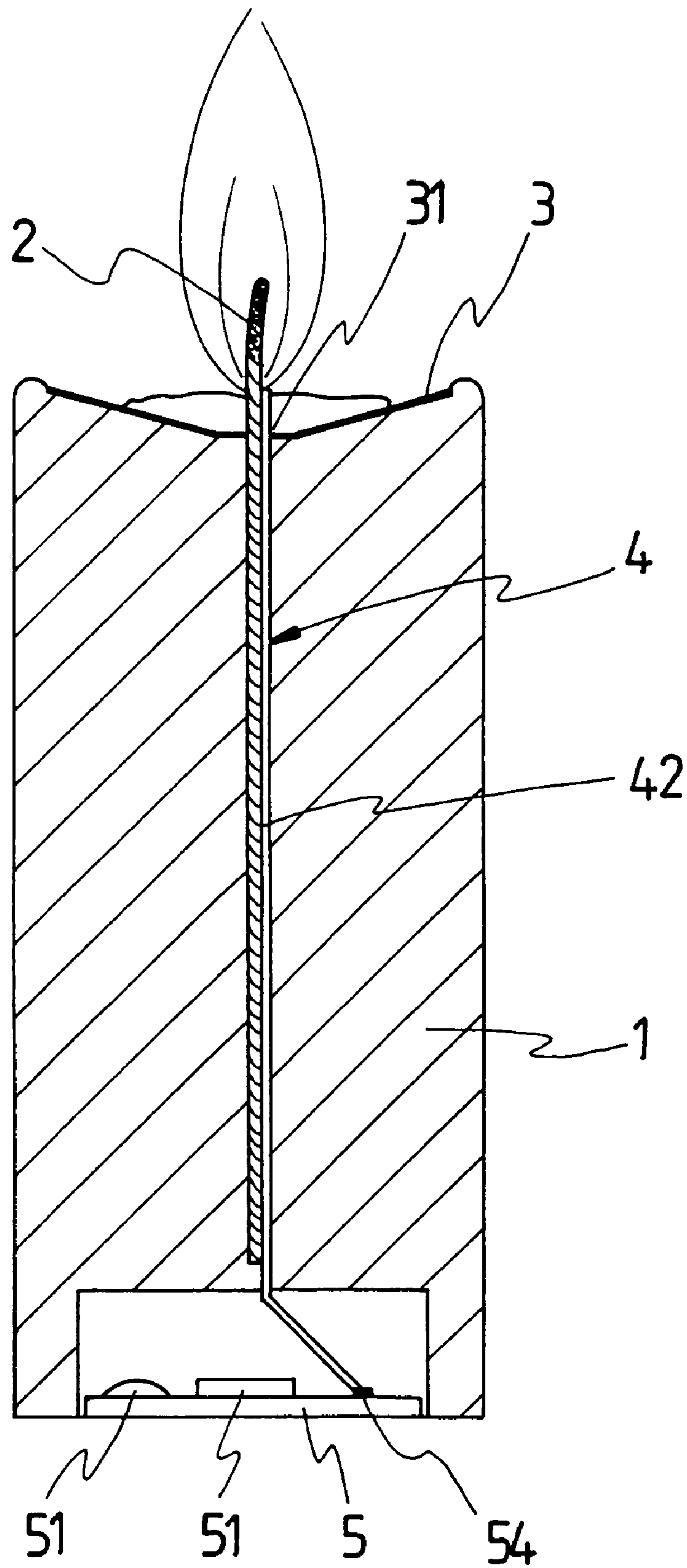


FIG.5

1

## ELECTRONIC SWITCH FOR DROP-FREE CANDLE

### BACKGROUND OF THE INVENTION

#### (a) Field of the Invention

The present invention is related to an electronic switch for a candle, and more particularly, to a conductor comprised of an optical fiber or a magnet twisted pair cable provided along a wick of the candle to control flaring, musical and other candle light variations while preventing drop of the fatty substance of the candle.

#### (b) Description of the Prior Art

Whereas a conventional candle is no longer a strictly portable light, its application tends to try multiple-layer and multi-directional development particularly in the entertaining purpose. Electronic flaring candle and musical candle are now generally available in the market. Usually, the burning wick controls the flaring or musical function. As the candle must be ignited to flare or sound musical tones, an electronic switch to control the candlelight is introduced. The switch while controlling the inherited electronic device in the candle also controls other electronic devices. However, the candlelight control device of the prior art is comparatively complicate to present certain difficulties in mass production.

Furthermore, a candle usually contains a linen or cotton wick. The burning wick produces heat to raise the temperature of and melt the candle in peripheral into fatty oil before being eventually consumed by the burning wick. However, it is difficult to control the flame of the candle and the burning wick may not keep straight all the time. The diverged flam often winds up that the certain part of the candle to the peripheral of the wick melts faster and even creates a gap. The fatty substance of the candle flows out to become drops that affect the appearance of the candle and quickly consume the candle.

### SUMMARY OF THE INVENTION

The primary purpose of the present invention is to provide an electronic switch that prevents the burning candle from creating any drop, thus to ensure the complete combustion of the candle but also eliminate drop resulted from diverged wick or flame for improved safety.

To achieve the purpose, the present invention is essentially comprised of a candle, a wick, a metal disk, a conductor and a circuit board. Wherein, the metal disk is provided inside the candle, and the conductor provided along the wick relates to a optical fiber or magnet twisted pair cable; so that once the candle is ignited, the conductor controls the circuit board provided at the bottom of the candle to realize the function of an electronic switch while the metal disk prevents the drop of the fatty substance of the candle.

Whereas the optical fiber is provided along the wick, the candlelight is emitted through the optical fiber to a photosensitive device closely connected to the optical fiber. The light then enabled the photosensitive device to control the operation of the electronic switch.

When the magnet twisted pair cable is used as the conductor, the cable is also provided along the wick. Once the candle is ignited, the temperature of the cable rises to melt the coating of the cable, and the cable is conducted to function as a switch.

To the present invention, the candle is melted not by the heat from the flame, instead, by the heated metal plate. Therefore, the melting is achieved at constant speed to

2

eliminate the gap while the metal plate also stops the fatty substance from escaping to ensure complete combustion of the candle without creating drop.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a preferred embodiment of the present invention.

FIG. 2 is a sectional view of an optical fiber of the preferred embodiment of the present invention.

FIG. 3 is a sectional view of a magnet twisted pair cable of the preferred embodiment of the present invention.

FIG. 4 is a schematic view of a circuit board of the preferred embodiment of the present invention.

FIG. 5 is a schematic view showing that a metal disk of the preferred embodiment of the present invention when the candle is lighted.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a drop-free electronic switch of the present invention is essentially comprised of a candle **1**, a wick **2**, a metal disk **3**, a conductor **4**, and a circuit board **5**. The present invention controls the electronic device by means of the burning candle to ensure complete combustion of the candle without creating drops due to diverged wick or flame for improved safety in use. Wherein, the wick **2** made of cotton is axially provided in the candle **1** for the wick **2** to stay burning on the top of the candle **1**. A metal disk **3** made of aluminum foil and indicating a V shape is buried in the upper part of the candle **1**. A circular opening **31** is provided at the center of the metal disk **3** to allow the wick **2** to penetrate through the metal disk **3**. The circuit board **5** is provided at the bottom of the candle **1** and connected to a conductor **4** along the wick **2**.

As illustrated in FIG. 2, the conductor **4** relates to an optical fiber **41**. An electronic device **51** and a photosensitive device **52** are provided on the circuit board **5**. The photosensitive device **52** is fixed to the base of the circuit board **5**. A mask **53** related to a circular cup is fixed to the peripheral of the photosensitive device **52** with the bottom of the cup fixed to the circuit board **5**. A through hole **531** is provided at the top of the mask **53** for the lower end of the optical fiber **41** to pass through. The optical fiber **41** is connected to the photosensitive device **52** so that the light from the burning wick **2** is emitted through the optical fiber **41** to control the operation of the circuit board **5**. The connection between the electronic device **51** and the photosensitive device **52** provided on the circuit board **5** may be provided in the form of integrated circuit block with a diode or a music circuit to realize the control function provided by the photosensitive device **52**.

Once the wick **2** is ignited, it emits light and the light passes through the optical fiber **41** of the conductor **4** to the photosensitive device **52** to enable the electronic switch. The candle of the present invention not only controls its inherited electronic supplies to function, such as flaring or music, but also control external equipment through a lead-out terminal.

Now referring to FIGS. 3 and 4, the conductor **4** of the present invention is provided in the form of a magnet twisted pair cable **42**, and the electronic device **51** and two bi-metal switch electrodes **54** are provided on the circuit board **5** by having both of the electronic device **51** and the bi-metal switch electrodes **54** fixed onto the circuit board **5** for the candle to become a flaring or musical candle. Furthermore,



3

both electrodes **54** are connected to an external circuit to realize the function of a candlelight control switch.

In practical use, the wick **2** of the candle **1** is ignited for the candle to emit light, and the coating of the conductor **4** comprised of the magnet twisted pair cable **42** is melted for the cable **42** to be conducted for providing the function of a switch to control the inherited electronic supplies of the candle, such as in the case of a flaring or a musical candle. External equipment can be also controlled by means of connecting a lead-out terminal.

As illustrated in FIG. **5**, a V-shaped metal disk **3** is provided in the upper part of the candle **1** and a circular opening **31** is provided at the center of the metal disk **3**. The diameter of the outer circumference of the metal disk **3** is slightly smaller than that of the candle **1**, and the diameter of the central opening **31** is slightly greater than that of the wick **2** and the conductor **4** put together. The wick **2** and the conductor **4** pass through the central opening **31** of the metal disk **3**. Accordingly, once the wick **2** is ignited, the flame of the burning wick **2** will not directly act on the candle **1** surrounding the burning wick **2** to prevent gap from different burning speed to the candle **1** surrounding the wick **2**. The flame acts upon the metal disk **3** instead. Since the heat conduction property of the metal disk **3** is consistent, the heated metal disk **3** will evenly melt the candle **1** without causing any drop. With the present of the metal disk **3**, it catches the falling wick **2** once the candle **1** is burning out to kill the flame of the wick **2** for achieving improved safety result.

Whereas the metal disk **3** of the present invention indicates a V-shape and may be made from an aluminum foil to take advantage the good reflection result provided by the aluminum foil. The light from the burning candle thus can be

4

reflected up to the ceiling to upgrade the light emission efficiency of the candle. Furthermore, the metal disk **3** may be printed with a letter or a pattern to create artistic or advertising effect on the ceiling as the light from the candle is reflected up to the ceiling.

What is claimed is:

**1.** An electronic switch for a drop-free candle comprised of a wick inside the candle is characterized by that a metal disk being buried in the upper part of the candle, circular opening being provided at the center of the metal disk for the wick to pass through; a circuit board containing electronic devices being provided at the bottom of the candle; and a conductor being provided along the wick to pass through the circular opening and connect to the circuit board wherein, the conductor is a magnet twisted pair cable having its lower end to connect the circuit board and wherein, the circuit board is provided with the electronic device and two bi-metal switch electrodes; both electrodes being connected to the electronic device; the lower part of the magnet twisted pair cable being split to respectively connect both electrodes of the bi-metal switch.

**2.** An electronic switch for a drop-free candle comprised of a wick inside the candle is characterized by that a metal disk being buried in the upper part of the candle, circular opening being provided a the center of the metal disk for the wick to pass through; a circuit board containing electronic devices being provided at the bottom of the candle; and a conductor being provided along the wick to pass through the circular opening and connect to the circuit board wherein, metal disk is a V-shaped aluminum foil and the through hole is provided at the center of the aluminum foil.

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